

REMARKS

Status of Application

Claims 1-20 and 21-22 are pending. Claim 21 has been cancelled. New claims 21 and 22 have been added.

Specification

The application has been objected to because of the lack of an abstract on a separate sheet of paper. Applicants have submitted the PCT abstract on a separate sheet of paper.

Claim Rejections - - 35 U.S.C. § 112

Claim 1 has been rejected under 35 U.S.C. § 112, first and second paragraphs, on the grounds that the claimed invention is not described in such full, clear, concise and exact terms as to enable any person skilled in the art to make and use the same, and fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The office action states that claim 1 is indefinite because it does not recite the sufficient distillation conditions such that a yield loss of propylene oxide of less than about 0.3 mole percent is maintained.

Applicants respectfully traverse this rejection. The language "sufficient to" is definite, particularly since it is defined according to functional criteria. The function to be achieved is to "maintain a yield loss of less than about 0.3 mole percent". One of skill in the art is able to determine from the written disclosure and the examples what the sufficient conditions are to maintain a yield loss of less than about 0.3 mole percent. Moreover, if any experimentation would be required to determine which conditions are sufficient to maintain such a yield loss, it would be routine experimentation for one of ordinary skill in the art. For example, one can easily measure the by-product concentration in the re-boiler of the distillation tower. If the by-product concentration exceeds the desired amount, the operating conditions can be adjusted to achieve the claimed ranges. This is easily done by starting with a high solvent to feed ratio and reflux to distillate ratio and then reducing both values until a minimum propylene oxide loss in the bottoms is measured by gas chromatography.

The office action states that claim 1 is also non-enabling because applicants recite at the paragraph bridging pages 14 and 15 of the specification that "suitable water to

purified propylene oxide (PO) stream ratio...is important in achieving optimum results in the extractive distillation...Likewise, a suitable reflux to distillate ratio is important in achieving optimum results" but claim 1 does not recite the above subject matter such that the scope of the disclosure is not commensurate with the scope of the claimed invention.

Applicants respectfully traverse this rejection. The language cited by the Examiner does not indicate that the missing recitations are critical for the invention to function as intended. The language cited by the Examiner indicates that the stream ratio and reflux to distillate ratio are important **in achieving optimum results**. The language does not indicate that these ratios are necessary or critical to practice the invention. Rather, the broad language of the specification indicates that such ratios are not critical or required to practice the invention. For example, the specification sets forth at p. 6, lines 29 -31 and carrying over to p. 7, the broadest concept of the novel process. Such limitations are not present in this concept. Further, in the specification immediately prior to the statements cited by the Examiner, the specification also states, for example, that the extractive distillation operating parameters can be varied, provided that the desired degree of propylene oxide is effected.

Features which are merely preferred are not to be considered critical. See MPEP § 2164.08(c). Claim 1 is commensurate with the scope of the disclosure and the specific conditions cited by the Examiner are not required to be recited.

Claims 1-21 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The office action states that claim 11 appears to be at odds with claim 1, the claim from which it depends. Applicants disagree with this conclusion, noting the definition in the specification of "essentially devoid of methanol and water", but have clarified the language of claim 11.

The office action finds that "it is unclear what constitute the "other glycols and other glycol heavies" recited e.g., in claims 10 and 12, within the context of the claimed invention." As explained on page 4, line 19, glycol heavies are glycol ethers. Claims 10 and 12 have been amended to recite "glycol ethers".

The office action states that in claims 17, step (d), the recitation of "from step (d)" provides for confusion. Applicants have amended claim 17, step (d) to refer to step (c) instead of step (d).

The office action finds that reciting a “first overhead” in claims 17 without further reciting a second, third and etc. overhead stream in the claims is identified as ambiguous, and also refers to claim 21. Applicants have amended claim 17 to replace the term “a first” by the term “an”. Claim 21 has been cancelled.

The office action finds that there are no proper antecedent bases for supports in the claims for the following claimed languages:

- 1) the presence of an epoxidation catalyst, claim 15; and
- 2) “the separation-purification process”, claim 16.

Applicants have amended claim 15 and 16 to provide proper antecedent bases or to eliminate the need for the same.

Nonstatutory Obviousness-Type Double Patenting Rejection

Claims 1, 3, and 7-8 stand rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-5 and 10 of US 7,323,579 (the ‘579 Patent). The examiner has determined that the conflicting claims are not identical but they are not patentably distinct from each other because the subject matter of the claims in the granted patent is covered in the instant claims. Further, these claims stand rejected on the same ground, since claims 1, 3 and 7-8, if allowed, would improperly extend the “right to exclude” already granted in the patent. The examiner states that the subject matter claimed in the instant application is fully disclosed in the patent and is covered by the patent since the patent and the application are claiming common subject matter. The examiner found no apparent reason why applicants were prevented from presenting claims corresponding to those of the instant application during prosecution of the application which matured into a patent.

Applicants respectfully traverse the rejection. The present application was filed prior to the patent which contains the claims which form the basis of the double-patenting rejection. In this situation, the typical policy concern of preventing an inventor from filing a series of applications to extend the term of patent protection improperly is not present because the application claims were filed **prior** to those of the issued patent.

Moreover, the Examiner has not, and cannot, present a *prima facie* case of obviousness for obviousness-type double patenting, using the test of *Graham v. John Deere Co.* 383 US 1 (1966). In particular, the Examiner has not demonstrated that any variations between the inventions being claimed would have been obvious to a person of ordinary skill in the art.

Claim 1 of the '579 Patent concerns a method of separating propylene oxide from a mixture (M) which comprises **5 to 15 percent by weight propylene oxide, 50 to 85 percent by weight methanol and 10 to 25 percent by weight water**. The mixture is introduced into an extractive distillation column, a polar solvent is introduced in an amount of two percent by weight of the mixture or less, the propylene oxide is distilled overhead at a bottoms temperature from 40 to 70°C and a pressure of from 300 to 750 mbar. Dependent claim 2 provides that the pressure is from 300 to 500 mbar. Dependent claim 3 provides that the polar solvent is introduced in an amount from 0.45 to 1 percent by weight of the mixture. Dependent claim 4 provides that the extractive distillation column has up to 80 theoretical plates. Dependent claim 5 provides that water is the polar solvent. Finally, claim 10 provides that the mixture is formed by reacting propene with hydrogen peroxide in methanol as solvent and in the presence of a titanium zeolite fixed-bed catalyst. Regarding the reaction product mixture, the '579 Patent teaches that the reaction mixture obtained from the epoxidation reaction may be directly introduced as the mixture (M) if the content of (M) regarding methanol, propylene oxide and preferably water is with above-mentioned ranges. (Col. 5, lines 12-15) Further, the '579 Patent teaches that "at the extractive distillation conditions according to the present invention, the high boiler fraction at the bottom of the column comprises, in addition to water and methanol, not more than 100 ppm, preferably no more than 75 and especially preferably no more than 50 ppm based on the weight of the high boiler fraction". (Col. 11, lines 24-29)

Claim 1 of the present application refers to a process for separating a purified propylene oxide from a propylene oxide reaction product. The reaction product comprises about **65 to 88 percent propylene oxide, 10 to 35 percent methanol, and less than about 0.5 percent water**. The mixture is introduced into a bottom section of an extractive distillation zone, water is introduced into an intermediate section of the extractive distillation zone, a bottoms stream is removed from the extractive distillation zone under distillation conditions, and an overhead or side-cut stream is removed. This overhead or side-cut stream comprises a purified propylene oxide essentially devoid of methanol and water. The extractive distillation conditions are sufficient to maintain a yield loss of propylene oxide of less than about 0.3 mole percent. There is no restriction on the amount of water which is introduced into the intermediate section.

Dependent claim 3 of the present application refers to an extractive distillation zone containing from greater than about 30 to less than about 100 theoretical plates.

Dependent claim 7 of the present application refers to operation of the distillation zone at an overhead temperature of greater than about 35°C and less than about 45°C.

Dependent claim 8 of the present application refers to operation of the distillation zone at a bottoms temperature of greater than about 55°C and less than about 75°C.

Thus, the reaction product which is fed to the extractive distillation column in claims 1-3 and 7-8 of the present application contains significantly more propylene oxide (65 to 88 %) than that of the reaction mixture in claim 1 of the '579 Patent (5 to 15%). One of skill in the art would thus expect a higher concentration of propylene oxide to be present in the bottom section of the extractive distillation zone of the present application than in the bottoms section of the '579 Patent.

The bottom section of the extractive distillation zone is the higher temperature location in an extractive distillation column. As one of skill in the art appreciates from the laws of reaction kinetics, the reaction rate of propylene oxide depletion is directly proportional to its concentration. The reaction rate increases with increasing temperature based on Arrhenius law. Thus, one of skill in the art would thus expect that more by-products will be formed in the bottom section of the method of the present application, leading to greater losses of propylene oxide. Instead, the process produces a surprising and unexpected yield loss of less than about 0.3 mole percent.

Applicants submit that all claims are in condition for allowance.

Respectfully submitted,

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